AMERICAN MUSEUM NOVITATES

Number 458 Published by THE AMERICAN MUSEUM OF NATURAL HISTORY New York City Feb. 27, 1931

59.57, 99(78)

ROCKY MOUNTAIN BEES. II

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THE GENUS *ANDRENA*

The genus *Andrena*, named by Fabricius in 1775, is very rich in species in the northern hemisphere. Viereck, in 1912, designated *Apis helvola* Linnæus as the type. Bingham (1897) had earlier designated *Andrena cineraria*, but Fabricius did not include this in his *Andrena*, and it was first transferred thereto by Latreille in 1802. According to Morice and Durrant (1915), Lamarck, in 1801, cited *Apis succincta* Linnæus as the type of *Andrena*. Now Latreille, in 1802, cited *succincta* Linnæus as the type of *Colletes*. In the Linnean cabinet a specimen marked *Apis succincta* is a *Colletes*, as we now understand the genus, but according to Nylander it is not the species commonly called *C. succincta*, but *C. fodiens*. But Linnæus described *Apis succincta* as having "rostrum subulatum." Kirby, as early as 1800, noted that this did not well describe the *Colletes*, in spite of the ostensible type. Morice and Durrant further note that the bee was said to have four white bands (presumably no more) on the abdomen. This latter objection seems to have no basis, as the expression well describes a female *C. succincta* auct. in my collection. As regards the subulate rostrum, the maxillæ, often projecting in *Colletes*, would give this effect. So it seems probable that the preserved specimen is really the type, and that on this basis *Colletes* = *Andrena*. At this point a further complication arises, in the fact that Lamarck's *succincta*, placed in *Andrena*, is definitely said to have the tongue long, even greatly elongated. Thus, if the Linnean *succincta* is a *Colletes*, Lamarck's identification of it is wrong. Morice and Durrant further cite *A. cineraria* (Linnæus), *A. bicolor* (Fabricius), and *A. nitida* (Kirby) as alternative designations, by various authors, as the type of *Andrena*. Of these, only *A. bicolor* was among the original species; the reference is to Panzer, 1806, but it is not clear that it was a specific designation of type. Hence, probably Viereck's designation stands. *A. bicolor* Fabricius, according to Alfken (1929), is the species usually known as *A. gwynana* (Kirby), a member of the "group of *A. nigroænea*" of

Perkins. *A. helvola* belongs to the "group of *A. varians*" of Perkins. In either case we have true *Andrena* as generally understood, not *Trachandrena*. I do not think that the confused condition of affairs with regard to Lamarck's designation and the Linnean type should for a moment be allowed to upset the current application of the names *Andrena* and *Colletes*.

Colorado, at the present time, has about 150 recorded species of *Andrena* in the broad sense (including one *Iomelissa*, one *Diandrena*, and one *Parandrena*). This assemblage must not be cited as a single fauna, for the species occupy different life-zones and different parts of the very large area. A genuine faunal unit is that of the vicinity of Carlinville, Illinois, where Robertson by intensive collecting during many years obtained 52 species (one still awaiting description). Of these, 21 have also been found in Colorado. Graenicher, in Wisconsin, secured 18 species which were not found by Robertson in Illinois. For the whole northern states, east of Kansas and Nebraska, I find records of about 115 species, a few of them probably not distinct. Although the western species are generally distinct, at least when we get west of the Rockies, Dr. Lutz has taken Robertson's *A. helianthi* and *A. pulchella* (*accepta* Viereck) at Ogden, Utah; while *A. crataegi* Robertson reaches Vancouver Island, as also do *A. cressoni* Robertson and *A. viburnella* Graenicher. Other species extending into the Pacific Northwest are *A. hippotes* Robertson, *A. illinoensis* Robertson,[1] *A. vicina* Smith, and *A. carlini* Cockerell.

Professor O. A. Stevens, several years ago, sent me a list of the species of *Andrena*, determined by Viereck, which he had collected in North Dakota. There are 44 species, and the list is particularly interesting for the combination of eastern and western forms. Twenty-five are also found in Colorado; a considerably larger proportion than in the Illinois list. Twenty are common to Robertson's Illinois list. Some of the western species represented are: *A. lincolni* Viereck and Cockerell, *A. idahorum* Viereck, *A. nigrihirta* (Ashmead), *A. albihirta* (Ashmead), *A. hitei* Cockerell, *A. campanulæ* Viereck and Cockerell, *A. apacheorum* Cockerell, *A. pertarda* Cockerell, *A. colletina* Cockerell, *A. prunorum* Cockerell, and *A. helianthiformis* Viereck and Cockerell. One species, *A. sigmundi* Cockerell, comes over from the Wisconsin (not Illinois) fauna.

[1]There is a curious controversy concerning *A. illinoensis*. Robertson long ago sent me specimens, and I accepted these as typical of the species, and so identified it in various papers. But, long after, Malloch visited Robertson and states that he had two species mixed, and that the specimen carrying the type label is actually *A. placitæ* Cockerell. My view was that my interpretation remained valid as that of a "first reviser," but against this is the fact that I made no conscious choice, and was wholly unaware that one had to be made. (See Entom. News, 1903, p. 215.)

New Mexico has 58 reported species of which 23 are common to Colorado. The New Mexico *A. prunorum* extends through Colorado to North Dakota, as just stated, while Lutz has taken it in Wyoming, Spalding in Utah, and Van Duzee in California. I believe that it was this species which was cited in Bull. Hayden Survey, 1877, p. 785, from Manitou, Colorado, as *A. polygama* Davis. The now famous geographer, Professor W. M. Davis, told me how, when he was a young man, he started to work on *Andrena*, and had described a number of species in manuscript. Leconte thought he did not know enough, and the matter was laid aside, and eventually abandoned owing to the pressure of other work. We cannot help regretting that these circumstances prevent us from associating the name of Professor Davis with this handsome species.

Ashmead also named many species of *Andrena* which he did not publish. When I visited him, during his most active period, at the U. S. National Museum, I took down the names of 32 species which he proposed to publish. So far as I know, he never actually described any of them in detail, though he had studied them a good deal. The four species from Colorado, which Ashmead described under the genus *Cilissa* in 1890, are all valid and well known. They were based on specimens which I collected in Wet Mountain Valley.

The species of *Andrena* are very frequently oligotropic, or at least restricted to a limited number of plants for their supply of pollen. This has certainly been a contributing cause to the multiplicity of species, and their often limited range. One of the most interesting cases is that of *A. parnassiæ* and *A. peckhami*, closely studied by Graenicher. They are extremely closely related, and might well have been considered variants of a single species, but for their habits. *A. peckhami* Cockerell visits Compositæ and appears with the early flowers of *Helianthus; A. parnassiæ* Cockerell is an oligotropic visitor (in the same region in Wisconsin) of *Parnassia caroliniana*, and flies considerably later, from August 25 to September 26, during the flowering period of the *Parnassia*. There can be little doubt that *A. parnassiæ* was derived from *A. peckhami*, but it is now a perfectly valid species. The willow-visiting species of *Andrena* seem, as a rule, not to discriminate between species of *Salix*, but there is one species, *A. nigræ* Robertson, which Robertson found only on *Salix nigra*. Graenicher, in his Wisconsin list, catalogues five species of *Andrena* which gather pollen from *Salix*, ten from the Compositæ, four from Umbelliferæ, and one each from *Claytonia virginica*, *Hydrophyllum*,

Geranium maculatum, *Fragaria*, and *Parnassia*. *A.* (*Iomelissa*) *violæ* Robertson is entirely restricted to the genus *Viola*.

Little has been recorded concerning the occurrence of more than one annual brood in American *Andrena*. Viereck found that *A. fulvipennis* Smith, described from Florida but extending up the coast to New Jersey, has two broods, flying in May and September (Entom. News, Oct., 1902). Viereck has recorded *A. kincaidii* Cockerell, of the Pacific Northwest, as occurring from April to July, and again late in September, but whether there is a regular fall brood remains to be ascertained. Of *A. pulverulenta* Viereck, it is stated that the male was collected May 15, the female September 25, but we may be permitted to question the association of the sexes. The Colorado species *A. vierecki* Cockerell flies in spring, but a female was taken at Boulder, August 24. Robertson, from his exhaustive studies in Illinois, separates the vernal species definitely from the autumnal. Referring to his segregated genera (which I treat as subgenera), he states (1902), "All of the genera mentioned here are vernal, except *Andrena* and *Pterandrena*. *Andrena* is vernal, with the exception of *A. nubecula*. *Pterandrena* is autumnal, with the exception of *P. lauracea*, *krigiana* and *rudbeckiæ*." Perkins (1919) found that in England *A. tibialis*, one of the earliest spring bees, was always single-brooded; while the very closely related *A. bimaculata* was double-brooded. *A. wilkella* and *A. ovatula* are also very closely related species, the former single-brooded, the latter double-brooded. Several species regularly produce a second brood in the south of England. Perkins adds: "In northern Europe species which with us, even in the extreme south of England, are invariably single-brooded produce a second brood in summer, the first brood often appearing earlier than our one brood of the same species." It is stated that *A. sericea* even has a third brood. Thus it cannot be said of a species that it is single-brooded, without qualification, until we know it in all parts of its range; but the number of broods differs in different species under the same environment.

An interesting form of variation in *Andrena* has to do with the replacement of red by black, or vice versa. Thus, in our own fauna, *Andrena prunorum* Cockerell has a black race, *arizonensis* Viereck and Cockerell, which looks like, and was first described as, a distinct species.[1] This kind of variation is more or less racial, and Friese has

[1]Even at Boulder, Colorado, a black form of *A. prunorum* is occasionally found. The insect named *arizonensis* is a little different, being more finely punctured. But later I received *arizonensis* from Santa Monica, California, and renewed study caused me to treat it as a race of *prunorum* (Pan-Pacific Entomologist, October, 1924, p. 57). Ordinary *A. prunorum* also occurs in California.

listed no less than nineteen Old World species in which there are two varieties or races, one with black abdomen, the other with the abdomen more or less red. In some cases the dark form is the typical one of the species, in others it is the rufous one.

There are many species of *Andrena* which have light tegumentary markings on the face in the male and some also in the female. Robertson, in his key (1902), uses this as one of the characters to separate his segregated genera (*Parandrena, Opandrena,* and *Pterandrena* having the light face-marks in the male), but shows that *Iomelissa violæ* varies in this respect within the species. In 1912 he wrote me: "Of seven *I. violæ* males, three have no face-marks, two have a dot on each lower corner of face, one has a dot on one side only, and one has dot on apex of clypeus." The European *A. humilis* Imhoff has the clypeus varying from white to black in the male. The original type had a black clypeus, but the form called *fulvescens* Smith, with white clypeus, is widely distributed over Europe. Morice examined the genitalia of the two forms and found no difference.

Perkins (1919) expressed the opinion that the light male clypeus represented a primitive condition in *Andrena,* but remarked that the British species with this character were diverse, not forming a natural group.

Perkins, after enumerating the eleven groups into which he separated the British species of *Andrena,* observed that even species from California or the Far East (names not specified) could sometimes be referred at once to these groups. Mr. Elven Nelson, in his study of *Andrena hitei,* has clearly shown its relationship to a European species, *A. fulva;* not only in external appearance, but also in the structure of the male. There is plenty of evidence to show that there are various minor groups of *Andrena* common to the Nearctic and Palæarctic regions. These must have crossed over when conditions for such migrations were more favorable, presumably in late Tertiary time. We know from the occurrence of fossils that *Andrena* is ancient in both regions. *A. primæva* Heer manuscript, Cockerell, is from the Miocene rocks of Baden, and there are five species fossil in the Miocene shales at Florissant, Colorado.

For the determination of species of *Andrena,* the male genitalia are often of great service, as the Rev. F. D. Morice set forth at length in 1899 (Trans. Ent. Soc. Lond., June, 1899, pp. 229-252). Morice used not only the genital armature, but also the last two sternites. By the study of these structures he was able to separate from *A.*

taraxaci Giraud two new species, *A. curtivalvis* and *A. stabiana*, which otherwise would hardly have been recognized as distinct. But once having established their distinctions, he was able to tabulate the females also, showing them to possess minute but quite visible specific characters. In our Rocky Mountain fauna, extensive studies of *Andrena* genitalia and sternites have been made by Mr. Elven Nelson, as will later appear. At the same time, Mr. Cecil Williams has studied the mouth-parts, finding excellent characters, likely to be especially useful in associating the sexes.

It will be readily understood, from the facts already stated, that many species of *Andrena* are highly "critical," while others run into various local races. Even in Central Europe, where so much attention has been paid to the subject, several new species have been described in quite recent years. The only way to understand rightly the complexities of this large genus is to group the species according to their affinities and present the differential characters in tables or keys. Long descriptions are not nearly so valuable as accurate comparisons with related species, but, on the other hand, we must deplore the introduction of new species in abbreviated keys with so little information that it is largely guess-work to determine what was intended. Even the best work on a single limited fauna has its disadvantages, owing to the fact that, while the various species may be clearly diagnosed from one another, it is difficult or impossible to know what characters will separate those forms from the races or close allies to be found in adjacent or distant regions. To a certain extent this vitiates all of our work on North American *Andrena* at present. We do not possess the materials for an adequate treatment of any group of the genus, as it occurs throughout its range. It is not desirable to hold up the work until such materials may be forthcoming, probably at some distant date, when they have been collected with a definite purpose in view. We can only point out that here is a vast undertaking for some future worker or workers, who will necessarily have to revise much of the work previously done, and of course add greatly to it.

The following records of *Andrena* are based on specimens in The American Museum of Natural History. These were collected by the Rocky Mountain expeditions of Dr. Frank E. Lutz, unless the contrary is specified. In spite of all that has been published, they add much to our knowledge, especially concerning the distribution of the species.

Andrena accepta Viereck

COLORADO.—Wray, ♀, Aug. 17; ♂, Aug. 14–19. At *Helianthus*. La Junta, ♂, Aug. 12.

UTAH.—Ogden, ♂, Aug. 29–30.

Andrena albihirta (Ashmead)

COLORADO.—Long's Peak Inn, June 16, 1922, ♀. At *Salix*.

This is a late date for the species, but the altitude is about 9000 ft. The specimen is unusual on account of the strongly reddened stigma and the very broad second cubital cell. *A. cockerelli* Graenicher can be distinguished from *A. albihirta* by the broader, pure black abdomen; that of *albihirta* appears by contrast a little greenish, though not actually green. What I have as male *A. cockerelli* from Boulder, Colorado, has the abdomen slightly greenish and is, I now believe, distinct from the Wisconsin species. More critical is the separation of *A. perarmata* Cockerell from *A. albihirta*. The male differs from Ashmead's species by the mandibles being strongly toothed beneath; but the females are so much alike that we may wonder whether the male is variable in respect to the tooth.

Andrena albosellata, new species

FEMALE.—Length about 10.5 mm., anterior wing 8.2 mm.; black, the thorax above with dense stiff not very long white hair, and long white hairs forming a band at the top of the occiput; the light hair is also found on tubercles and metathorax, but the vertex, front, face, cheeks and mesopleura have black hair; facial quadrangle broader than long; malar space linear; process of labrum deeply emarginate; antennæ black, third joint about twice as long as fourth; disc of clypeus shining, with scattered strong punctures, and a rather ill-defined median smooth band; front finely striate; facial foveæ entirely dark, separated above from ocelli by fully as much as width of an ocellus, ending below at level of top of clypeus, separated only by a shining line from eye; mesothorax dull, a little shining posteriorly, the punctures so small as to be hardly visible under a lens; scutellum like hind part of mesothorax; area of metathorax dull, without evident sculpture; tegulæ small, shining black; wings dusky; stigma narrow, reddish with dark margin; basal nervure falling short of nervulus; second cubital cell about square, receiving recurrent nervure at about beginning of last third; legs with black hair; abdomen moderately shining, not banded, the punctures minute and inconspicuous; first two tergites with long white hair, but some black at sides of first, and almost the lateral thirds of second with black; beyond this the hair is rather abundant, and black; second tergite in middle depressed hardly a third. In the Wyoming specimens the black hair on tergites is shorter, and there is long white hair on under side of hind femora, but I consider them to belong to the same species.

COLORADO.—Pagosa Springs (type locality), 7500 ft., June 21–23, F. E. Lutz, collector.

WYOMING.—Stewart Ranger Station, July 18, 1920, 6700 ft. Two specimens.

This is so much like *A. bebbiana* Viereck and Cockerell that it might be thought identical were it not that *bebbiana* flies at the end of March, and has an entirely different clypeus, dull and very hairy. Compared with *A. edwiniæ*, *A. albosellata* is much smaller, and also separated by the black hair on face. The hair of thorax above is much shorter than in *A. milwaukeensis* Graenicher. The dark tibial scopa separates it from *A. hemileuca* Viereck.

Andrena apacheorum Cockerell

COLORADO.—Tennessee Pass, about 10,500 ft. altitude, ♀, July 30–Aug. 2, Aug. 6–8, Mrs. F. E. Lutz, collector. Ward, ♀, Aug. 8–10. Aspen, ♀, July 24–27. Leadville, ♀, Aug. 3–5, H. F. Schwarz, collector.

Andrena argemonis Cockerell

COLORADO.—White Rocks near Boulder, July 30, ♀. At *Cleome serrulata*.

Andrena birtwelli subatrata, new subspecies

FEMALE.—Hair of mesopleura long and black, but that of thorax above creamy-white, extending on to tubercles; hair of front and sides of face abundant and black, but of lower half or more of clypeus creamy-white, or the long hair at sides of face may be white; cheeks with black hair. The facial foveæ are dark; mesothorax dull; wings brownish hyaline; stigma ferruginous or fulvous with heavy dark margin; second cubital cell receiving recurrent nervure much beyond middle; hair of hind tibiæ and tarsi black or dark, but basitarsi with a little pure white tuft at tip; abdomen without bands, apical fimbria black. There is long white hair on the first tergite, whereas *A. clypeoporaria* Viereck and *A. hemileuca* Viereck have pale hair on the first two tergites. From *A. merriami* Cockerell it is easily distinguished by the much larger depression of second tergite and less shining abdomen. It is a melanic form of *A. birtwelli* Cockerell, apparently constant where it occurs.

COLORADO.—Tennessee Pass (type locality), 10,500 ft., Aug. 6–8, 1920, Mrs. F. E. Lutz, collector. Also same locality and date, July 30–Aug. 2, 1919. Aspen, July 24–27, 1919, 8000 ft., H. F. Schwarz, collector (three specimens).

WYOMING.—Stewart Ranger Station, July 18, 1920, 6700 ft.

Andrena (Trachandrena) brevibasis, new species

FEMALE.—Length about 10 mm., anterior wing about 9; a species with bright red abdomen, and so close to *A. mariæ* Robertson that it is best defined by comparison with it. Compared with *A. mariæ* (from Ames, Iowa, and Long's Peak Inn, Colorado) the mesothorax anteriorly is more shining and less closely punctured; the stigma is larger and duller red; the area of metathorax is much more finely sculptured (the fine plicæ, to the number of about twenty-five, evanescent apically in middle portion, and generally so weak that it is necessary to look closely to see

the *Trachandrena* character); the pale golden depressed part of first tergite practically impunctate (distinctly punctured in *mariæ);* the second tergite depressed nearly to base, leaving only a very narrow basal elevated band, not half as broad as in *mariæ;* depression of third tergite also much more extensive; hair on inner side of hind basitarsi light reddish (dilute chocolate in *mariæ*). There is no trace of white hair-patches at sides of abdomen. Wings reddish hyaline, basal nervure meeting nervulus; second cubital cell high, receiving recurrent nervure well beyond middle. Face somewhat broader than in *A. mariæ;* mandibles red at tip; process of labrum broadly rounded, subtruncate; tarsi and hind tibiæ rather dusky red; flagellum entirely dark, with no red band beneath.

WYOMING.—Green River, July 2, 1920, alt. about 6100 ft., F. E. Lutz, collector.

Andrena bruneri Viereck and Cockerell

WYOMING.—Laramie, June 14, 1920, altitude 7200 ft., three specimens.

A. hicksi is very closely allied, but is distinguished by the more shining very dark purplish abdomen; the area of metathorax more narrowed apically, with a slightly shining margin; and the very broad second cubital cell.

Andrena (Trachandrena) corrugata, new species

FEMALE.—Length about 10.3 mm.; black, including antennæ and legs (the basitarsi brownish); hair of head and thorax long and loose, sordid white, faintly yellowish above, especially in region of tubercles; head ordinary, face broad; red hair on under side of head in region of mouth; process of labrum broadly truncate; malar space linear; clypeus convex, shining, with no smooth line, apical portion with well separated punctures, but basally the strong punctures are dense; supraclypeal area closely punctured; front densely punctured; third antennal joint hardly as long as next two together; facial foveæ grayish white, separated above from ocelli by a shining space about as wide as an ocellus, but below narrowed, and separated from eyes by a rather broad shining band (the narrow lower end of facial fovea, well separated from orbit, at once distinguishes the species from *A. semipunctata* Cockerell); cheeks with abundant long hair; mesothorax dull, densely and strongly punctured, with a smooth median line; scutellum more shining, but strongly punctured, with no median sulcus; area of metathorax dull, with strong coarse rugæ; mesopleura dull, without evident sculpture; tegulæ piceous, with a red spot on outer side; wings brownish hyaline; stigma well developed but rather narrow, very dark brown; basal nervure meeting nervulus; second cubital cell large, about square, receiving recurrent nervure a little beyond middle; third cubital somewhat narrower on marginal than second; legs with pale hair, the scopa of hind tibiæ very pale fulvous; hair on inner side of hind basitarsi copper-red; spurs red; abdomen broad, convex, without bands, but a little pale marginal hair at sides of tergites two to four; tergites dullish, finely and weakly punctured, second tergite in middle depressed about three-fifths, fourth depressed more than half; apical fimbria fulvous; hind margins of tergites very narrowly brownish.

WYOMING.—Jackson, July 13–17, 1920, about 7000 ft., F. E. Lutz, collector.

Distinguished from *A. indotata* Viereck by much darker stigma, and larger, more strongly sculptured metathoracic area. From *A. lincolni* Viereck and Cockerell it is known at once by the color of the legs and the much larger second cubital cell. The area of metathorax is quite unlike that of *A. moscovensis* Viereck and Cockerell. I have not seen *A. amphibola* Viereck, from Oregon, but it is evidently distinct by the brownish foveæ, and the rugose mesothorax without distinct punctures. In *A. corrugata* the mesothorax posteriorly has very distinct punctures running in oblique rows.

Andrena costillensis Viereck and Cockerell

COLORADO.—Ward, ♀, Aug. 8–10. Leadville, ♀, Aug. 3–5. Tennessee Pass, ♀, July 30–Aug. 2. About 11,000 ft. altitude.

Andrena (Trachandrena) cyanophila Cockerell

COLORADO.—Tennessee Pass, 10,500 ft., Aug. 6–8, and about 10,300 ft. altitude, July 30–Aug. 2. Electra Lake, eight specimens, June 28–July 1, at *Potentilla filipes*. Cornet Creek, Telluride, about 10,000 ft., July 9. All females.

WYOMING.—Jackson, about 6300 ft., July 13–17.

The specimens from Tennessee Pass and Electra Lake have the hair on inner side of hind basitarsi darkened. I thought at first to separate them, but on close comparison there is no satisfactory basis for a distinctive name.

Andrena (Trachandrena) eriogoni Cockerell

COLORADO.—Glenwood Springs, ♀, Aug. 5, 1920, Mrs. F. E. Lutz, collector.
IDAHO.—Montpelier, ♀, July 6, about 6100 ft.

The clypeal ridge varies, and may be distinct or evanescent.

Andrena erythrogastra (Ashmead)

COLORADO.—Julesburg, ♀, about 3460 ft., June 7. Nine specimens. At *Salix*.

Andrena hallii Dunning

FEMALE.—Length about 13 mm.; black, with hair of thorax above, including tubercles, bright fox-red, very dense and mosslike; between the wings, the hair is thinner, so that looked at from above there is the appearance of a black band, and there are in fact some scattered dark hairs on hind part of mesothorax and on scutellum; the occiput has pale fulvous hair, but on the rest of the head it is black, sometimes appearing grayish on the clypeus; hair of pleura black, of metathorax mainly black, but partly pale at sides; legs and abdomen with black hair; tegulæ black; wings fuliginous, with dark brown nervures, and small but not lancellate dark reddish stigma with dark margin. Process of labrum broadly truncate (Dunning says

emarginate for *A. hallii*, but I found it truncate); clypeus brilliantly shining, with shallow close punctures and a weak median ridge; facial foveæ dark chocolate, reaching orbits of lateral ocelli; antennæ black, third joint about or nearly as long as next two combined; mesothorax densely punctured, moderately shining posteriorly, but not polished; area of metathorax small, triangular, the marginal area thickened and somewhat shining, forming a thick V, the base not at all plicatulate (as it is in typical *hallii*); second cubital cell very broad, receiving recurrent nervure at or a little beyond middle; abdomen closely and extremely finely punctured on a tessellate surface (as in *hallii*); second tergite in middle depressed about a third; caudal fimbria and long hair on venter black. Median line of clypeus not distinctly tessellate.

WYOMING.—Rock Springs, ♀, June 29, 1920, about 6500 ft., six specimens. Cheyenne, ♀, June 11, 1920, about 6000 ft. altitude, one specimen. Rawlins, ♀, June 26, 1920, 6800 ft. altitude, three specimens.

UTAH.—Eureka, ♀, June 14, 1920, Tom Spalding, collector.

Dunning described *A. hallii* from Pullman, Washington, and Moscow, Idaho. I hereby designate Pullman as the type locality. The species is a very handsome one and quite distinct. I thought at first to treat the Wyoming and Utah form as a distinct race, but on close analysis could find no satisfactory basis for such action. I give a description, based on a specimen from Rock Springs.

Andrena helianthi Robertson

COLORADO.—La Junta, ♀ and ♂, Aug. 12, Mrs. F. E. Lutz, collector. Wray, ♀ and ♂, Aug. 17–19, at *Helianthus*. Boulder, ♀ and ♂, Aug. 7–12.

UTAH.—Ogden, ♀, Aug. 29–30.

Andrena hirticincta Provancher

COLORADO.—Ward, ♀, Aug. 8–10, Pearce Bailey, collector.

WYOMING.—Mountains near Sheridan, ♂, (Metz).

Andrena hitei Cockerell

COLORADO.—Boulder, ♀, May 27–28. June 6, at *Rubus deliciosus* and *Prunus*, probably *melanocarpa*. South Fork of Rio Grande, ♀, June 17, about 8500 ft. altitude.

Andrena johnsoniana Cockerell

Described from a female taken on Johnson Mesa, New Mexico, July 7. It had been suggested that it was identical with *A. cressonii* Robertson, and I asked Miss Sandhouse to examine the unique type in the U. S. National Museum. It is quite distinct from *A. cressonii* by the following characters:

Front punctostriate (in *cressonii* densely and deeply punctured with a medial polished streak above the carina extending to anterior ocellus); punctures of mesoscutum more shallow and widely separated on middle of disc; propodeum dull and

more coarsely sculptured; second cubital cell higher than broad, receiving recurrent nervure very near apex (in *cressonii* it is as broad as long, and receives recurrent nervure near middle); third cubital cell on marginal almost equal to 1+2 (in *cressonii* the third is about equal to first); abdominal tergites less densely and distinctly punctured; apical fasciæ of tergites in type badly worn, but apparently originally not so dense.

Andrena lupinorum Cockerell

COLORADO.—Ward, June 25.

WYOMING.—Camp Roosevelt, Yellowstone Park, July 14–17, E. L. Bell, collector.

Andrena (Trachandrena) lutzi, new species

FEMALE.—Length about 11 mm., anterior wing 9.3 mm.; robust, black, except the upper side of abdomen, which has strong purple and green colors; hair of head black, scanty; of thoracic dorsum and tubercles creamy-white, the hairs stiff, erect, and thick; pleura with black hair, sides of metathorax with gray; hair of legs and abdomen black, the latter without bands; process of labrum broadly truncate, not emarginate; third antennal joint about as long as next two together; flagellum entirely black; clypeus excessively coarsely and densely punctured, with a median smooth ridge; malar space very short; cheeks shining; facial foveæ purplish gray, very broad above, almost reaching lateral ocelli, narrowed below to an obtuse point slightly below level of antennæ, with a shining band between foveæ and orbits; mesothorax and scutellum dull, with very large but not very dense punctures; area of metathorax strongly longitudinally plicate, with a transverse ridge posteriorly; mesopleura very coarsely rugose, with a tuberculate effect; spurs black; tarsi rufescent at tips; tegulæ black anteriorly, posteriorly dark brown; wings brownish hyaline, violaceous, stigma large, dark reddish-brown, nervures dark fuscous; basal nervure meeting nervulus; second cubital cell small, receiving recurrent nervure well beyond middle; abdomen with a microscopical sculpture of very fine transverse lines, on first tergite also with a minute tessellation, but raised portions of tergites smooth, with rather sparse strong punctures; the apical depressions occupy most of the tergites, even the first, leaving broad elevated laterobasal area, narrowly connected across the middle, the second tergite depressed practically to the basal transverse ridge over which the first slides; venter very finely and densely punctured, the margins of the sternites narrowly testaceous. The facial quadrangle is much broader than long.

WYOMING.—Stewart Ranger Station, about 6700 ft. altitude, July 18, 1920, F. E. Lutz, collector.

A very remarkable and distinct species, nearest to *A. cleodora* Viereck, but easily separated by the light hair on thorax above.

Andrena mariæ Robertson

COLORADO.—Boulder, ♀, May 24, at *Salix*, M. D. Ellis, collector. Julesburg, ♀, June 7, at *Salix*, abdomen considerably darker than in the Boulder one.

Andrena mentzeliæ Cockerell

COLORADO.—Grand Junction, ♂, Aug. 3; ♀, Aug. 3. Apparently asleep in squash flowers at 9:30 A.M. Jim Creek, near Boulder, ♀, July 8, Mrs. F. E. Lutz, collector. Pueblo, ♀, Aug. 9.

Andrena mustelicolor Viereck

IDAHO.—Bear Lake, July 9, ♀. Superficially, this looks like *A. nubecula* and *A. sieverti.*

The three (females) are readily separated thus:

1.—Second cubital cell receiving recurrent nervure about middle; wing with no apical cloud; scutellum entirely dull.....*mustelicolor* Viereck.
Second cubital cell receiving recurrent nervure well beyond middle, or not far from end.....2.
2.—Stigma very dark; wing with a conspicuous apical cloud.....*nubecula* Smith.
Stigma light ferruginous; scutellum highly polished.....*sieverti* Cockerell.

Andrena nigerrima pineti, new subspecies

FEMALE.—Like *A. nigerrima* Casad (which has been taken as far north as Sioux County, Nebraska, in May, L. Bruner, collector) but somewhat smaller and less robust; process of labrum small, truncate (more pyramidal in outline in *nigerrima*), disc of mesothorax much more shining.

WYOMING.—Pine Bluffs, ♀, June 9, 1920, altitude 5050 ft., F. E. Lutz, collector. Two specimens.

Perhaps a distinct species. Among the black species with black hair it is known by the short malar space, the rather small size (anterior wing 7.5 mm.), the clypeus polished on disc, and the narrow dull ferruginous stigma with dark margin. The third antennal joint is conspicuously longer than the next two together. It is considerably smaller and less robust than *A. irana* Cockerell, and as in *A. nigerrima,* has the depressed part of second tergite distinctly brown.

Andrena nubecula Smith

COLORADO.—Wray, ♀, Aug. 17–19.

Andrena pertarda Cockerell

COLORADO.—Meadows, Estes Park, ♀, Aug. 17. Ridgway, ♀, July 15, H. F. Schwarz, collector. Ward, ♀, Aug. 8–10.

The following key separates the females of a number of species flying in late summer and autumn:

1.—Hair of thorax bright fox-red; wings brown; abdomen with red hair-bands. *vulpicolor* Cockerell.
Hair of thorax yellow or grayish, not red.....2.
2.—Caudal fimbria black, or grayish or brownish black.....3.
Caudal fimbria pale.....6.

3.—Abdomen without evident hair-bands; hair on tubercles pale reddish; clypeus with a strong median carina..... *semirufa* Cockerell (New Mexico).
Abdomen with very distinct hair-bands.....4.
4.—Smaller (anterior wing about 7.3 mm.); clypeus shining, with a smooth ridge or band; second cubital cell about square, receiving recurrent nervure much beyond middle..... *apacheorum* Cockerell.
Larger; clypeus without a smooth ridge or band.....5.
5.—Abdominal hair-bands white, rather narrow; second cubital cell very large and broad..... *barberi* Cockerell (New Mexico).
Abdominal hair-bands very broad, yellowish; second cubital cell ordinary; stigma light ferruginous..... *pertarda* Cockerell.

Three other species are closely related, and are distinguished thus:

Very like *pertarda*, but differs by black hair of middle and hind tibiæ and tarsi, and wings without a dark apical cloud; also, the facial foveæ are more or less reddish at upper end..... *hirticincta* Provancher.
Very like *hirticincta* but less robust; hair at apex of abdomen yellow stained with red; hair of hind legs pale yellow. The broad middle tarsi are fringed with yellow instead of black hair; only the small joints of tarsi are reddened; the abdomen appears broadly black between the bands (Pan-Pacific Entomologist, I, p. 60)..... *surda* (Cockerell).[1]
Runs to *pertarda* in table, but differs by black hair at sides of tergites 3 and 4, and also in wings and facial foveæ..... *colletina* Cockerell.
6.—Large species, with abdominal hair-bands thin and inconspicuous. *haynesi* Viereck and Cockerell.
Abdominal hair-bands strong and conspicuous.....7.
7.—Stigma small, dark reddish; second cubital cell broad, receiving recurrent nervure about middle; hair of scutellum pale yellowish-fulvous. *townsendi* Viereck and Cockerell (New Mexico).
Stigma well developed, clear bright ferruginous; second cubital cell receiving recurrent nervure well beyond middle.....8.
8.—Larger (anterior wing about 9.3 mm.); clypeus highly polished, hardly punctured in middle..... *mentzeliæ* Cockerell.
Smaller; clypeus well punctured all over..... *costillensis* Viereck and Cockerell.
Similar to *costillensis*, but mesothorax smooth and brilliantly shining; flagellum red beneath..... *ramaleyi* Cockerell (Colorado).

The males of some of the above, the clypeus with dark tegument, and the abdomen with very distinct hair-bands, are separable thus:

1.—Hair of thorax white, with little or no yellow tint; stigma deep ferruginous, more or less narrowed basally; scutellum shining anteriorly.....2.
Hair of thorax strongly yellow; stigma clear orange-ferruginous, hardly or not narrowed basally.....3.
2.—More robust; abdominal bands dense and white (August, at Compositæ). *costillensis* Viereck and Cockerell.

[1]The female referred to *A. surda* came from California; the species was described from the male, which has been taken in Colorado and Wyoming. Thus, the identification of the female, while apparently correct, may be subject to revision.

Less robust; abdominal bands narrower, and grayish....*apacheorum* Cockerell.

3.—Hair of abdomen bright yellow; hind tarsi red; scutellum shining *surda* (Cockerell).

Hair of abdomen pale or ochreous.....4.

4.—Larger (anterior wing 8.5 mm.); scutellum dull, only shining along anterior margin; abdominal tergites 4 and 5 with black hair before the band. *colletina* Cockerell.

Smaller; scutellum shining; abdominal tergites 4 and 5 without black hair..5.

5.—Supraclypeal area highly polished; first recurrent nervure joining second cubital cell little beyond middle; nervures ferruginous.....*mentzeliæ* Cockerell.

Supraclypeal area rough and dull; first recurrent nervure joining second cubital cell well beyond middle; nervures fuscous.....*hirticincta* Provancher.

Andrena porteræ Cockerell

COLORADO.—Apex Canyon, Golden, ♂, May 1, 1921 (L. O. Jackson).
WYOMING.—Pine Bluffs, ♀, June 9, 5050 ft. altitude.

Andrena (Trachandrena) postnitens, new species

FEMALE.—Length 10 mm. or slightly over; black, the hair of head and thorax white, long and outstanding on mesopleura; head broad, facial quadrangle broader than long; malar space short but distinct; mandibles reddish at end; process of labrum broadly rounded, shining; clypeus convex, densely rugose-punctate, dullish, without any trace of a smooth line, the upper three-fifths of clypeus somewhat shining and distinctly punctured, the lower two-fifths dull, the sculpture hardly visible under a lens; supraclypeal area and sides of face shining; front striate; facial foveæ clear white, broad above, approaching lateral ocelli, ending obtusely at level of top of clypeus, the lower part separated from eye by a narrow shining band; antennæ entirely black, third joint about as long as next two together; vertex dull; cheeks with a broad shining band behind the eyes, but otherwise dull; mesothorax shining, strongly punctured, but punctures on disc very sparse, median sulcus deep; scutellum shining, sparsely but strongly punctured, with a median sulcus; area of metathorax dull, the rugæ distinct but not very strong, toward the middle irregular and forked, but a strong median keel; mesopleura shining above, dull below, minutely rugulose; tegulæ black, reddish brown posteriorly on margin; wings dusky hyaline, somewhat reddish; stigma large, dull ferruginous, not dark margined; nervures dull ferruginous; basal nervure meeting nervulus; second cubital cell large, oblique, receiving recurrent nervure near beginning of last third; legs black, with small joints of tarsi rufous; hair of legs mainly white, but red on inner side of basitarsi, and inner face of anterior tibiæ; scopa of hind tibiæ white, dense; spurs red; abdomen highly polished, as if oily, not evidently punctured, hind margins of tergites more or less rufescent; second, third, and fourth tergites in middle depressed almost to base; no hair-bands; apical fimbria pale, partly fulvous; venter with thin bands of long white hair.

WYOMING.—Stewart Ranger Station, about 6700 ft., July 18, 1920, F. E. Lutz, collector.

Closely resembles *A. politissima* Cockerell from Idaho, but larger, and the white facial foveæ broader above, separated from lateral ocelli

by about half the width of an ocellus; while in *A. politissima* the foveæ are yellowish, and separated from ocelli by about width of an ocellus. There are several other differences. From *A. nuda* Robertson it is known by the quite different metathorax and the elevations at sides of second tergite rounded (not pointed) posteriorly. The metathorax is also quite different from that of *A. multiplicata* Cockerell. In my manuscript key it runs nearest to *A. cyanophila* Cockerell, but is at once separated by the more extensively depressed second tergite. It lacks the patches of white hair at sides of abdomen seen in *A. semipunctata* Cockerell, which also has a dull mesothorax.

Andrena prunorum Cockerell

COLORADO.—Boulder, June 30, ♀, at *Petalostemon*. Glenwood Springs, ♂, July 22–29; ♀, Aug. 5, H. F. Schwarz and Mrs. F. E. Lutz, collectors. Jim Creek, near Boulder, ♀, Aug. 3, at *Argemone platyceras*. White Rocks, near Boulder, ♀, July 30, at *Cleome serrulata*. Palisades, ♂, July 18, at *Melilotus alba*.

WYOMING.—Rawlins, ♀, June 26. Medicine Bow, ♀, June 23.

UTAH.—Eureka, ♀, June 19, July 8, Tom Spalding, collector.

IDAHO.—Bear Lake, ♂, July 9.

Andrena prunorum variety **gillettei** Cockerell

COLORADO.—South Fork, ♀, June 17. Ward, ♀, June 25, at dandelion. Boulder, ♀, May 29. James Denham, collector.

WYOMING.—Jackson, ♀, July 13–17.

A. prunorum belongs to a group with red and black abdomen, separating as follows:

1.—Females.....2.
Males.....5.
2.—Clypeus more or less red.....3.
Clypeus black.....4.
3.—Scutellum, and postscutellum red; mesothorax red marked with black. *mellea* Cresson.
Scutellum and postscutellum black.....*prunorum* Cockerell.
4.—Larger; anterior corners of mesothorax broadly and densely covered with red hair, or if the hair is not very red it is conspicuously dense and mosslike; the second tergite is duller.....*argemonis* Cockerell.
Smaller; anterior corners not thus covered.....*prunorum* Cockerell (variety).
5.—Larger; clypeus black.....*argemonis* Cockerell.
Smaller; clypeus yellow.....*prunorum* Cockerell.

Andrena (**Trachandrena**) **rodecki** Cockerell

This species, described (female) from Boulder, Colorado, proves to be so close to *A. lincolni* Viereck and Cockerell (described from Lincoln, Nebraska) that it may be only subspecifically distinct. *A.*

lincolni is readily distinguished from *A. rodecki* by the red mandibles and lower margin of clypeus, reddish tegulæ, all the tibiæ (or at least middle and hind ones) red, and better developed hair-bands. A specimen of *A. lincolni* from Lisbon, N. D. (Stevens), differs from the type in having the front tibiæ black.

There are four species with ferruginous stigma, which may be tabulated thus:

1.—Hair overlapping foveæ light brown; thorax dorsally with reddish-brown hair; tegument of legs black (Oxbow, Saskatchewan, F. Knab).... *indotata* Viereck.
Hair overlapping foveæ white; thorax dorsally with white or creamy-white hair.....2.
2.—Clypeus strongly glistening, flattened on disc; a rather narrow species. *ceanothi* Viereck.
Clypeus densely punctured, convex in middle; hind tibiæ and tarsi red.....3.
3.—Larger, with very broad abdomen; stigma dark-margined; fourth tergite with an entire pure white hair-band..... *lincolni* Viereck and Cockerell.
Smaller, build of *ceanothi;* stigma not dark-margined; fourth tergite with no such band..... *moscovensis* Viereck and Cockerell.

The type of *A. lincolni* was taken in April, but the North Dakota specimen on June 5.

Andrena rufojugata, new species

FEMALE.—Length about 12.5 mm., anterior wing 10.5; black, robust, the head and thorax with stiff fulvous pubescence, becoming bright fox-red on tubercles, anterior part of mesothorax, and scutellum; facial quadrangle somewhat broader than long; malar space linear; mandibles slender in middle; process of labrum broadly truncate, not at all emarginate; eyes with very sparse short hairs (these also present in *A. lupinorum*); clypeus flattish, closely punctured, the punctures running in rows, and with no median smooth line, except toward the apex, where there is a short longitudinal smooth band; flagellum obscurely reddish beneath; third antennal joint fully as long as next two combined; facial foveæ (seen from above) pale grayish, fulvous, broad above, ending below about level of top of clypeus, narrowly separated from orbits; mesothorax dull, granular-punctate, glistening on posterior disc; scutellum finely punctured, glistening, with a strong median sulcus; area of metathorax entirely dull, without evident sculpture; tegulæ dark brown, covered with red hair in front; wings dilute fuliginous, the general effect quite dark; stigma narrow but well developed, dusky rufous; nervures fuscous; basal nervure meeting nervulus; second cubital cell large, receiving recurrent nervure distinctly beyond middle; anterior femora with long pale fulvous hair, but on tibiæ and tarsi it is grayish brown, shining pale yellowish on tibiæ behind, while on inner side of the very thick and large basitarsi it is rufescent; middle and hind legs with dark chocolate-brown hair, but the heavy scopa of hind tibiæ, seen in an oblique light, is shining whitish; spurs red, abdomen broad, shining, very finely and weakly punctured, without hair-bands, though there is some pale hair at sides of first two tergites, and on the third it extends very weakly part way along the margin; hair at sides of fourth tergite black, but apical

fimbria warm grayish-red; second tergite depressed about a third; sternites with thin bands of long hairs.

WYOMING.—Jackson, July 13–17, 1920, altitude about 6300 ft., F. E. Lutz, collector.

Very close to *A. lupinorum* Cockerell, but distinguished at once by the entirely pale fulvous hair of mesopleura, pale reddish caudal fimbria, third antennal joint shorter, and no complete median raised line on clypeus.

Andrena sieverti Cockerell

WYOMING.—Stewart Ranger Station, ♀, variety with more or less rufescent mid and hind tarsi, July 18, Mrs. F. E. Lutz, collector.

Andrena (Trachandrena) sphecodina Casad and Cockerell

A female from Colorado Springs, Colorado, at willow, April 22 (W. P. Cockerell), has the white patches of hair at sides of abdomen, characteristic of this species, and must be referred here, although the abdomen is larger and darker than in the typical *A. sphecodina* from New Mexico. I had labeled it *A. mariæ*, variety.

Andrena surda (Cockerell)

WYOMING.—Sheridan (Metz), ♂.

Andrena transnigra Viereck

COLORADO.—South Fork of Rio Grande, 4 ♀, June 17, altitude 8500 ft.

This species has a band of black hair across the middle of the thoracic dorsum; but it is a singular thing that *A. victima* Smith from Albany, N. Y., looked at from above, also seems to have such a band; but there is no black hair, and effect is due entirely to the thinner pubescence allowing the black surface to show. The specimen of *A. victima* referred to, received from the U. S. National Museum, has the light hair of thorax above colored as in *A. transnigra;* but Smith's type, which I examined in the British Museum, has the hair of scutellum quite bright orange-fulvous, all the thoracic hair being of this color, though not everywhere so bright.

Andrena wilmattæ Cockerell

Described in 1906 on the same page as *A. johnsoniana*, the female said to be 8 mm. long. The type is in the U. S. National Museum and Miss Sandhouse reports that it measures about 12 mm. The error

seems to have arisen in copying or printing, the length of the species just above being repeated.

A. wilmattæ was collected at Boulder, Colorado, June 4. A month later I published *A. pyrura*, taken at Boulder on the same day. They appeared to be separable thus (females):

Hair of head and thorax long, grayish white, with a slight creamy tinge on scutellum, etc.; legs black.....*pyrura.*
Thorax above covered with fulvous hair, long and dense and very bright orange-fulvous on scutellum and postscutellum; hind tarsi clear red, their tibiæ largely red.....*wilmattæ.*

Subsequent studies have indicated that these are matters of variation, and that the two supposed species are one. Furthermore, it has appeared that this species did not differ in any essential particular from *A. commoda* Smith (*corni* Robertson). However, more recently I again made comparisons, and was able to find some characters, thus:

1.—Punctures on second tergite weak; first tergite dull or dullish.....*pyrura.*
Punctures on second tergite distinct and regular; first tergite polished.....2.
2.—Wings darker (Falls Church, Va., July 4, Cockerell).....*commoda* (*corni*).
Wings paler (Boulder, June).....*commoda* (*corni*), var.

Last summer, at the British Museum, I took occasion to look again at the type of *A. commoda* Smith, and noted that the abdomen was finely rugose-punctate, not distinctly punctured. It thus appears probable that there are two or three very closely allied species, which it will be difficult to separate. *A. pyrura* was said to differ from *A. corni* (*commoda*) by the clypeus lacking a distinct median ridge, paler tibial scopa, darker tarsi, etc. *A. commoda* was described from Canada, *A. corni* from Illinois. As stated in Psyche, February, 1906, I compared *A. corni* with the type of *commoda*, and found no difference. The clypeus of *commoda* has a strong median ridge.

Andrena xanthigera Cockerell

In 1900 I described two supposed species, based on females taken at San Ignacio, New Mexico, September 1, 1899. They were said to be allied to *A. nubecula* Smith, and were separated in a key thus:

Process of labrum with a deep emargination; stigma black.....*xanthigera.*
Process of labrum with a shallow emargination; stigma pale.....*albovirgata.*

Subsequently, Viereck considered them to be one species, and that identical with *A. canadensis* Dalla Torre. The types are in the U. S. National Museum, and, as I have not seen them for many years, I

asked Miss Sandhouse to look into the matter. She reports that she agrees with Viereck concerning the identity of *albovirgata* with *xanthigera*, but the species is definitely distinct from *A. canadensis*, using for comparison specimens of the latter determined by Viereck. Her comparison was made with *A. albovirgata*, which differs from *canadensis* thus:

Head, viewed from in front, shorter and broader; facial foveæ not distinctly visible when viewed with naked eye (clearly visible in *canadensis*); pubescence in foveæ not pure white and densely appressed as it is in *canadensis;* front more coarsely striate; clypeus with punctures about twice as close together; mesoscutum much more sparsely punctured; dorsal surface of propodeum almost shining, reticulate (in *canadensis* dull and coarsely granular).